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ABSTRACT

Designed as a self-teaching tool for those who have had no experience with computers and who are seeking an understanding of the microcomputer, this set of lesson cards teaches the beginner how to write simple computer programs in the BASIC language. The learner is also taught to (1) determine what computers can and cannot do; (2) load a tape or disk; (3) use the computer as a calculator; (4) correct mistakes by backspacing, deleting, and using cursors; (5) use all of the keys on the keyboard; (6) write a simple program to solve arithmetic problems; and (7) record and save a program. The lessons apply to most microcomputers; two of the cards specifically apply to a Commodore microcomputer. A set of worksheets and an answer key accompany the cards along with a glossary of computer terminology. Teaching suggestions for using these cards in a scheduled computer class are made. Student behavioral objectives are listed and three computer user's tests are provided. (JH)

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"THE CHIPS ARE DOWN"

REVISED EDITION

Beginnner's Self-Teaching Basic Computer Lessons

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INTRODUCTION

This set of cards was prepared as a self-teaching tool for all people who are curious and seeking an understanding of a microcomputer as it is used in education, in the home, and in a small business.

Through the use of these cards you will be able to understand the BASIC Language used to write simple programs. You will learn to load or save your program using tapes or disks. These cards apply to most microcomputers. See your manual for differences.

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TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

This is a beginning. The technical language has been omitted. There are many books which you will probably want to choose from after you have finished these cards. These cards are for people who have had no experience with computers and who need BASIC understanding. They are not for learning math skills.

There is a set of work sheets on which to record your answers and an answer manual to accompany this set of cards.

Corrections:

Card#71 Line 10 For X=1 to 20

All function commands do not have a space between the function and the parenthesis. Cards-54, 60, 64, and 71

Examples: TAB(16)
SQR(64)
INT(X)
RND(1)

You are about to embark on an exciting adventure. A computer is a tool. Computers can be used as calculators. Computers can be programmed to make decisions. Computers have some permanent memory called ROMS (read only memory). You put information into programs. This information is called RAMS (random access memory). Computers only accept a certain language. Most microcomputers use BASIC language (Beginner's All-purpose Symbolic Instruction Code). Some other computer languages are FORTRAN, COBOL, PASCAL, LOGO, and PILOT.

To use a computer you must follow four steps:

1. Organize the information.
2. Write a detailed set of instructions.
3. Put the instructions in a form the computer will understand.
4. Find and correct all errors (debug).

You may use a tape or disk commercial program. You may write your own game or lesson program and save it on tape or disk.

GETTING STARTED

1. Plug in computer.

2. Turn on switch at the back or side of computer.
   (The screen will become full of letters and symbols while warming up.)

3. Type on keyboard THIS IS FUN. (The space bar is for spacing.)

4. Press the RETURN key. The return key tells the computer that you have finished typing a line and now it's the computer's turn to work.

5. The RETURN key enters your information. Some computers have an enter key instead of a return key.

6. The computer should now say ?SYNTAX ERROR.
   This means that the computer did not understand what you said.
   Remember: YOU MUST SPEAK BASIC LANGUAGE. A syntax error is a language error.

7. Try the letters on the keyboard. Try the numbers. Notice the difference between the letter O and the number Ø (zero).

8. Hold down the shift key and press other keys. These are the graphic keys.

9. The flashing box is called a cursor. Press the cursor keys. They look like this:

Try the shift key with the cursor keys. The cursor symbol tells you where your next letter, number, or symbol will be printed on the screen. Move the cursor up and down, right and left.

10. Practice using the insert/delete key. Type a letter. Now press [INST/DEL] key. Did you see the letter disappear?
If you used the [INST/DEL] key with the shift key you will be able to insert a letter.

11. Place the cursor on top of a letter. Now press the shift and [INST/DEL] keys. You now have a space to insert a letter. No matter what key you press, there is no way to damage the insides of the computer.

12. To clear the screen, press [SHIFT] and [CLR/HOME] at the same time. The cursor moves to upper left and the screen becomes blank.

HOW TO CORRECT ERRORS

1. Type on the computer:

   HOW NOW BLACK COW

2. Move the cursor until it appears on the B and press the space bar key until BLACK is gone. Move the cursor to the left and type in BROWN.

3. To remove the word BROWN put cursor on N and press the delete key until BROWN is gone. Did you notice how the COW moved backwards?

4. If you want a PURPLE cow now, press [SHIFT] and [INST/DEL] until you have enough space for the PURPLE.

5. Make some mistrakes of your own and correct them.

THE COMPUTER AS A CALCULATOR

Type the following lines exactly. Be sure you type the word PRINT. This is a command in BASIC language to tell the computer to PRINT the answer. Press return after each line to tell the computer to do the problem.

```
PRINT   32*29
PRINT   262+324
PRINT   4*4
PRINT   8↑2
PRINT   5↑3
PRINT   54/6
```

Write the answers on your answer sheet.

What does * mean?

What does / mean?

What does ↑ mean?

Write five more problems on your answer sheet and use the computer to find the answers.

PRINT AND ?

Type:

```
PRINT 2+2     (press RETURN)
PRINT 4-2
    ? 6*2
    ? 12/2
```

A question mark is a short cut for the word PRINT.

QUOTATION MARKS

Type:

PRINT "THIS IS EASY" (RETURN)

What did the computer print?

Type:

PRINT HELLO (press RETURN)

What did the computer print?

What did you find out about quotation marks?

Now type in a print message.

The print statement instructs the computer to display data on the screen.

TICK TOCK

(For Commodore)

The PET has a clock inside of it. When you turn on the computer it starts at ØØ hours, ØØ minutes, and ØØ seconds.

Type:

?TI$ (press RETURN)

How long has the computer been turned on?

The clock is a 24-hour clock that starts at midnight. To set the clock to the correct time:

Type:

TI$=" " (Put the correct time within the quotation marks)

For Example: TI$="142313"

(hour) (minutes) (seconds)

Now type:

?TI$ (press RETURN -- record the time on your answer sheet.)

PROGRAMS

When you program, you must give the computer directions in "BASIC" language. The next few cards may seem too easy but will help you understand the way the computer follows your commands.

Computers do not make mistrakes!!!!

Each statement requires a line number. Line numbers are usually 10, 20, 30, etc. If you discover you have forgotten a statement, you can add a line such as 11, 12, 15, etc. The computer will put it in place for you.

PROGRAMMING

Programs conta[illegible]control, remark, and instruction statements. Control statements are NEW and RUN.

If there is a program in memory, you must type NEW before typing a new program. NEW "erases" the old program.

Type NEW and press RETURN.

When you turn off your computer, all of the typed or taped programs are erased (the RAMS).

RUN tells the computer to obey your commands.

Type RUN and press RETURN.

NEW

Type:

```
NEW
10 ? "LET'S"
20 ? "EAT"
30 ? "POPCORN"
40 END
RUN                          What does the computer print?
```

Type:

```
10 ? "JOHN AND MARY"
RUN
```

Because you did not type NEW or a line 20 or line 30, lines 20 and 30 are still in the program.

Write a program on your answer sheet that will print your name four times. Try it on the computer.

RUN

Type:

```
NEW
10 ? "HI MOM"          (press RETURN)
RUN
```

```
NEW
10 ? "JOHN LOVES MARY"    (RETURN)  (What happens when
                                     you don't type RUN?)
```

```
NEW
10 ? 1+2*3
RUN
```

```
NEW
10 ? 1+2*3=
RUN                    What does the computer say?
                       What is wrong with the last line 10?
                       Equal sign is not used in BASIC.
```

LINE NUMBER ORDER

Type:

```
10 ? "H"
20 ? "A"
30 ? "T'"
40 ? "S"
50 ? "N"
60 ? "E"
70 ? "W?"
 5 ? "W"
RUN
```

(Remember to press RETURN after each statement.)

Now Type:

```
45 ?
RUN
```

What happens when you type line 45?

RETURN KEY

The RETURN key ENTERS your directions to the computer. If you change a line, be sure to press RETURN to enter your corrections.

The CURSOR will appear at beginning of next line.

LIST

Type:

```
NEW
40 PRINT "GREATEST"
10 PRINT "MARKHAM SCHOOL"
30 PRINT "THE"
20 PRINT "IS"
RUN
```

Now Type:

```
LIST
```

Compare the list with what you typed. The computer printed the lines in order.

Now Type:

```
LIST 10    Change line 10 to read "EL DORADO"
RUN
```

Now Type:

```
LIST 10-30
```


REMINDER

When you type LIST	The computer will reproduce the program and will put the line numbers in order even though you did not type them in order.
When you type LIST 10	The computer will list line 10.
When you type LIST 100-200	The computer will list line 100 through 200.
When you type PRINT or ?	The computer will print the value.
When you type PRINT or ? " "	The computer will print what is typed between the quotation marks.
When you type END	The computer is told that the program is over.

SPACING

Type exactly:

```
NEW
10 PRINT 35+5
20PRINT35+5
30  PRINT  35  +  5
RUN
```

What does the computer say?

Type:

```
LIST                (press RETURN)
```

What does the computer do when you type LIST?

Now retype Line 30 without spaces in the word PRINT. Do you have to leave a space between line number and the word PRINT? Do you have to leave spaces between 35+5? May you leave spaces? If you print your program, it will look better if you space.

PUNCTUATION

```
NEW
10 ? "your town"
20 GO TO 10
30 END
RUN
```

PRESS [RUN STOP] KEY.

Retype Line 10 "your town";

What does the semi-colon do?

Retype Line 10 ? "your town "; (leave 5 spaces)

```
NEW
10 ? "COMMA",
20 GO TO 10
RUN
```

The comma divides the screen into zones of ten spaces. Try this on your computer and experiment with the comma.

GO TO

CONTINUOUS PROGRAM LOOPING

Type:

```
NEW
10 PRINT "THIS IS A LOOP."
20 GO TO 10
RUN
```

Press STOP when you get tired of reading, "THIS IS A LOOP." What happened?

The computer printed Line 10 over and over again because the "GO TO" statement in Line 20 told the computer to go back to Line 10 every time it finished printing Line 10 and got to Line 20 again.

This is an infinite loop It will keep repeating itself until you tell it to stop.

LOOPING

```
NEW
10 PRINT "your name"
20 GO TO 10
30 END
RUN
```

PRESS [RUN/STOP] key to stop the run.

Type [CONT] to continue (don't forget to press RETURN).

Press [OFF/RVS] to slow down the program.

LOOPING

1. Write on your answer sheet a program to print another name or slogan continuously.

2. Type your program on your computer.

3. Write on your answer sheet a program to make a continuous design.

4. Type your program on the computer.

VARIABLES

In an expression or equation, the letters that represent numbers are called variables. When you want to use more than the 26 letters of the alphabet, you can use a letter and a number, such as A1, B1. (These are alpha-numeric variables.)

Type:

```
NEW
10 A=10
20 B=9
30 C=3
40 D=2
50 ? A,B,C,D
60 ? A+B/C-D
RUN
```

What are the answers?

The computer records the variable values of a given program.

The computer does multiplication and division first.

Now you write a program using different variables (letters) and different numbers.

VARIABLES

Type:

```
NEW      (Press RETURN after every entry)
?A       What does the computer say?
```

Type:

```
A=2+2
?A       What is the output?  (Output is what is on your screen.)
```

Type:

```
?B       What is the output?
B=2*A
?B       What is the output?
```

Type:

```
A=2+3
?A
?B       Why isn't B=10?
```

> The computer remembers only the last given value for the variable. The variable is always zero unless you give it a value.

Type:

```
B=2*A
?B       What is the output?
```


LET

Type:

```
NEW
10 LET X=2        (Press RETURN after each line.)
20 LET Y=1
30 ? X+Y
RUN
```

Type:

```
10 X=2
20 Y=1
30 ? X+Y
Run
```

(Do you have to use the word LET?)

CONTINUING WITH LOOPING

Type:

```
NEW
10 K=1
20 PRINT K                    [K starts at 1]
30 K=K+1
40 GO TO 20
RUN
```

Type: [K starts at 1]

```
30 K=K+2
RUN
```

To count by 2's with even numbers type:

```
NEW
10 K=K+2                      [K starts at 0]
20 ?K
30 GO TO 10
RUN
```


IF...THEN and GO TO

(Conditional Loops)

Type:

```
NEW
10 K=1
20 K=K+1
30 ?K
40 IF K=100 THEN 60
50 GO TO 20
60 END
RUN
```

In Line 40, what does the 60 mean?

In Line 50, what does the 20 mean?

This is a conditional loop because there is a limit to K's value?

COMMAS AND SEMI-COLONS

Type:

```
NEW
10 K=1
20 K=K+1
30 ?K,
40 IF K=100 THEN 60
50 GO TO 20
60 END
RUN
```

This is almost exactly the same program previous except for the comma. What difference did the comma in Line 30 make?

Change the comma in Line 30 to a semi-colon. What happened?

Commas divide the screen into "10-space" zones.
Semi-colons cause output to be close together.

IF...THEN LOOP

Type:

```
NEW
10 K=1
20 IF K > 10 THEN 60
30 PRINT K*K
40 K=K+1
50 GO TO 20
60 END
RUN
```

Now write a program to print squares up to 25^2 and run.

COUNTING USING FOR...NEXT

Type:

```
NEW
10 FOR X=1 TO 20
20 ?X
30 NEXT X
RUN
```

Type:

```
NEW
10 FOR Y=10 TO 30
20 ?Y
30 NEXT Y
RUN
```

You must use the word NEXT after you use FOR. The "FOR ... NEXT" controls the loop to the number of times stated after the word "FOR."

FOR...NEXT WITH A STEP

Type:

```
NEW
10 FOR N=2 TO 20 STEP 2
20 PRINT N
30 NEXT N
40 END
RUN
```

The "STEP 2" statement tells the computer to count by 2's.

The "N=2 to 20" tells the computer to begin counting at 2 and to stop counting at 20.

Change Line 10 to say:

```
10 FOR N=20 TO 0 STEP -2
RUN
```

Now you create a program to write the odd numbers from 1 to 25.

Write a program for the multiples of 3 from 1 to 100.

MORE LOOPING

Type:

```
NEW
10 N=2
20 N=N+2
30 ?N
40 IF N>20 THEN 60
50 GO TO 20
60 END
```

What would happen if you left out Line 40?

Type:

```
NEW
10 A=A+1
20 ? A↑2
30 IF A<20 THEN 10
40 IF A=20 THEN 50
50 END
RUN
```

What would happen if you left out Line 40?

MORE LOOPING

Type:

```
NEW
10 B=B+1
20 ? B,B*10, B/10
30 GO TO 10
```

[Before you type RUN, can you guess what is going to happen?]

Now Type:

```
RUN
```

The "B=B+1" tells the computer to start counting on 1 and to continue counting by adding one to the number before it:

1,2,3,4,5...

COLON

Type:

```
NEW
10 ? "HI MOM": GO TO 10
20 END
```

The ":" allows you to use the same line for two commands.

Write a program putting two commands on one line.

EMPTY LINE

Type:

```
NEW
10 ? "I'M UP HERE"
20 ?
30 ? "YOU'RE DOWN THERE"
RUN
```

What does Line 20 do?

Retype Line 20 as:

```
20 ?:?
```

Write a program using three lines with spaces between each line.
Record your program and its output.

REM (Remark) STATEMENTS

Example:

```
10 REM THIS PROGRAM WAS WRITTEN BY MIKE RO CHIP, 4-18-83
20 REM THIS PROGRAM WILL PRINT THE PRICE OF AN ITEM INCLUDING
   SALES TAX
```

The REM statement has no effect on the program.

It serves as a reminder to the programmer and gives information to the user.

STRINGS

Type:

```
NEW
10 C$="VERY"
20 E$="GOOD"
30 ? C$; C$; E$
RUN
```

Now change Line 30 with the following Line 30:

```
30 ? C$, C$, E$
RUN
```

Now change Line 10 to this:

```
10 C$="VERY  "  (leave 2 spaces)
```

And change Line 30 to this:

```
30 ? C$; C$; E$
RUN
```

"$" is a symbol for a string.

"C$" stands for what group of letters and numbers.

STRINGS

Type:

```
NEW
1Ø A$="Your First Name"
2Ø B$="Your Last Name"
3Ø ? A$, B$
4Ø ? B$, A$
5Ø END
```

Now write a program using strings that will print your name and address.

TALKING WITH YOUR COMPUTER

INPUT

INPUT statements allow a person to interact (talk) with the computer.

Type:

```
NEW
1Ø ? "WHAT IS YOUR NAME?"
2Ø INPUT A$
3Ø ? "HI  " A$     (leave 2 spaces)
```

When the program is run, Line 2Ø will print a question mark and wait for the user to input a name.

INPUT

Type:

```
NEW
10 ? "HOW OLD ARE YOU",
20 INPUT N
30 ? "ISN'T",N,"TOO YOUNG TO TALK TO COMPUTERS?"
```

Type:

```
NEW
10 ? "HOW MANY HOURS OF SLEEP DID YOU GET LAST NIGHT?",
20 INPUT K
30 IF K>8 THEN 60          [> means greater than]
40 ? "THAT'S NOT ENOUGH!!"
50 GO TO 10
60 ? "THEN WHY DO YOU ACT SO SLEEPY?"
RUN
```

Remember, an INPUT statement always appears as a question mark when you run a program and requires a response from the user.

INPUT

Type:

```
NEW
10 ? "HOW OLD ARE YOU?"
20 INPUT Y
30 ? "YOU ARE "; 365*Y; " DAYS OLD."
RUN
```

Now add without typing NEW:

```
40 D=365*Y
50 ? "YOU ARE "; 24*D; " HOURS OLD."
60 H=24*D
70 S=H*3600
80 ? "YOU ARE "; S; " SECONDS OLD."
RUN
```

How old are you in seconds?

IF...THEN INPUT

Type:

```
NEW
10 ? "HOW OLD ARE YOU?"
20 INPUT A
30 IF A>17 THEN 60
40 ? "YOU WILL BE ABLE TO VOTE IN" 18-A "YEARS"
50 GO TO 70
60 ? "YOU ARE ALREADY OLD ENOUGH TO VOTE."
70 GO TO 10
RUN
```

Now, you write a similar program on your answer sheet using IF...THEN and INPUT statements.

FOR...NEXT INPUT

Type:

```
NEW
10 FOR A=1 TO 5
20 ? "*****"
30 NEXT A
RUN
```

Save time by leaving the original lines in the program.

DON'T type NEW.

```
 5 ? "HOW MANY LINES OF ***** DO YOU WANT?"
 7 INPUT N
10 FOR A=1 TO N
```

Type:

```
LIST
```

Notice that the computer put the new lines in order for you.

HOW MUCH MONEY?

Type:

```
NEW
10 ? "HOW MANY QUARTERS DO YOU HAVE?"
20 INPUT Q
30 ? "YOU HAVE" 25*Q "CENTS"
40 GO TO 10
RUN
```

Study this program. Now write a program to tell how much money if you have dimes?

FOR THE EXPERT: Write a program if you have two kinds of coins.

INPUT

The following cards are programs to give you some ideas about how the computer can work for you.

For example, if you want a program to tell you how much something will cost after you add the tax, use this program:

[A = cost of item]
[.06 is the decimal form of 6% tax]

Type:

```
NEW
10 ? "COST OF ITEM"
20 INPUT A
30 ? A+.06*A
RUN
```

For values of A use the price of various items such as:

1. a coat for $39.95.
2. the price of a pair of shoes.
3. a piece of sports equipment.

Type:

```
NEW
10 ? "PLACERVILLE TO SAN FRANCISCO"
20 ? "DISTANCE IS 140 MILES"
30 LET D=140
40 ? "SPEED IS"
50 INPUT S
60 LET T=D/S
70 ? "TRAVEL TIME IS" T "HOURS"
80 ?
90 GO TO 50
100 END
RUN
```

Now write a program of your own calculating the travel time between two other cities.

INPUT

Here is a program that will tell you how much carpet you need in a room:

Type:

```
NEW
10 INPUT "LENGTH OF FLOOR IN FEET"; L
20 INPUT "WIDTH IN FEET"; W
30 ? "YOU NEED"; (L*W)/9; "SQ. YARDS OF CARPET."
RUN
```

Now write a program that will tell you how much wallpaper you need in a room.

FOR EXPERTS: Now modify the program to tell you how much it will cost if the carpet or wallpaper is $5.99 a square yard.

INPUT

You are the owner of Hugo's Hamburger House. Write a program for your computer that will use INPUT statements for the number of hamburgers ($.89), french fries ($.63), and soft drinks ($.39) sold each day. Have it tell you the total amount of your sales.

Write your program on your answer sheet.

MATH PROGRAMS

The next 14 cards will teach you about math programs. We will be using many of these symbols.

+ addition	= equal to
- subtraction	< less than
* multiplication	> greater than
/ division	<= less than or equal to
↑ to the power of	>= greater than or equal to
SQR(N) square root of N	<> not equal to

ORDER OF OPERATION

Math students need to know in what order the computer performs the operations.

This card will help you find out what operation the computer does first.

Type:

```
? 1+2*3              [press RETURN after every line]
? 5+5-2*3
? 5+(5-2)*3
? (5+5)-2*3
? 5+((5-2)*3)
```

Write each answer on your answer sheet. What operation does the computer do first?

SCIENTIFIC NOTATION

Type:

```
? 14592345261                [RETURN]
```

What does the computer print?

Type:

```
? 12345678                   [RETURN]
? 12345.6789123              [RETURN]
```

The computer will not print more than 9 digits. It uses scientific notation and expresses the number as a decimal between 1 and 10, times a power of 10. The E means exponent. The number following the E is the power of 10.

SQUARES AND SQUARE ROOTS

Type:

```
? 3↑2                          [press RETURN]
? SQR (16)                     [press RETURN]
? SQR 25
        What happened?  (What is the syntax error?)
? SQR (32)
? 26↑2
```

Try five other squares and square roots. Write down your problems and answers.

FUN LOOP

Type:

```
NEW
10 ? "VALUE", "SQUARE", "SQUARE ROOT"
20 A=A+1
30 ? A, A↑2, SQR(A)
40 GO TO 20
50 END
RUN
```

How would you change the program to stop when the value of A is 20?

SQUARES, CUBES

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VARIABLE POWER

Type:

```
NEW
10 FOR N=1 TO 5
20 ? N, N↑2, N↑3
30 NEXT N
40 END
RUN
```

Type:

```
NEW
10 FOR N=1 TO 14          [The N is the variable]
20 ? 2↑N                  [The exponent varies]
30 NEXT N
40 END
RUN
```

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PROGRAM A FORMULA

Type:

```
NEW
10 ? "AREA OF A CIRCLE"
20 ? "ENTER RADIUS"
30 INPUT R
40 A=π*R*R                [PET knows the value of pi]
50 ? "AREA IS"; A
RUN
```

Type:

```
NEW
10 ? "AREA OF A CIRCLE"
20 ? "ENTER RADIUS"
30 INPUT R
40 P=3.14
50 A=P*R*R
60 ? "AREA IS"; A
RUN
```

Explain why the two above programs get the same results. What could you type instead of R*R? Run one of the above programs 3 times using 3 different values for R. Record your values and areas.

QUOTES IN MATH PROGRAMS

Type:

```
NEW
10 A=35+5
20 ?"35+5=" A
RUN

NEW
10 A=9
20 B=3
30 ?"A*B", "A-B", "A+B"
40 ?A*B, A-B, A+B
RUN
```

Write two other programs using quotes. Write the output.

FOR...NEXT

You can give X and Y more than one value. EXAMPLE: For X=1 to 3 means X=1, X=2, X=3.

Type:

```
NEW
10 FOR X=3 TO 6
20 FOR Y=1 TO 4
30 PRINT X+Y
40 NEXT Y
50 NEXT X
60 END
RUN
```

Can you "walk through" this program with pencil and paper? Write all of the combinations.

Will this program run if you do not type the word "FOR"?

Now, you write a program on your answer sheet multiplying 5 different values for X and Y. Try your program on the computer.

INTEGER FUNCTION

```
? INT (1.66)                    [press RETURN]
```

Computer drops the decimal part of the number.
It does not round.

```
? INT (.33694)                  [press RETURN]
```

Computer prints a Ø and drops the decimal part of the number.

We will use this function to have the computer make random numbers.

RANDOM FUNCTION

Type:

```
NEW
10 ? RND(1)
20 GO TO 10
RUN
```

Computer gives random numbers Ø through 1.

Change line:

```
10 ? INT (RND(1))
RUN
```

Integer function causes the computer to give all Ø's because RND(1) is less than 1.

Change line:

```
10 ? INT (10*RND(1))
RUN
```

Gives numbers from Ø through 9 because you have multiplied the decimal by 10.

RANDOM FUNCTION (continued)

CHOICE OF RANDOM NUMBERS

Read: This format in your program will generate (give) random numbers between B and (B+A-1).

```
INT (A*RND(1)+B)
```

Type:

```
10 ? INT (6*RND(1)+1)          [This program gives random
20 GO TO 10                     numbers from 1 to 6.]
RUN

10 ? INT (7*RND(1)+3)          [This program gives random
                                numbers from 3 to 9.)
```

You write a program on your answer sheet to generate different random numbers. Try it on the computer.

MATH PROBLEMS USING RANDOM INTEGERS

Type:

```
NEW
10 A=INT (10*RND(1)):B=INT (10*RND(1))
20 ? " " A:?"+"  B:?"__":INPUT C
30 IF C=A+B THEN? "RIGHT ON!":?:GO TO 10
40 ? "YOU GOOFED, TRY AGAIN.":?:GO TO 20
RUN
```

Now write a program for multiplication.
Write a program for two-digit numbers.

GUESS MY NUMBER GAME

Type:

```
NEW
10 M=INT (10*RND(1)+1)
20 ? "GUESS MY NUMBER"
30 INPUT Q
40 IF Q=M THEN ? "YOU GOT IT!":GO TO 70
50 IF Q <> M THEN ? "NO! TRY AGAIN."
60 ? "DO YOU WANT TO TRY AGAIN?"
70 INPUT D$
80 IF D$="NO" THEN 100
90 IF D$="YES" THEN GO TO 10
100 ? "GOOD BYE!"
RUN
```


MAKING THE COMPUTER WAIT

(Time Delay)

Type:

```
NEW
10 ? "ARE YOU"
20 FOR X=1 TO 1500
30 NEXT X
40 ? "IN A BIG"
50 FOR X=1 TO 1500
60 NEXT X
70 ? "HURRY?"
80 FOR X=1 TO 3000
90 NEXT X
100 ? "I'M NOT!!"
110 END
```

[The X is the time delay part of the program. The computer counts X but does not print it.]

Try different values than 1500 and 3000.

Now, you write a time delay program. Write it on your answer sheet.

COUNT DOWN

Type:

```
NEW
10 FOR Z=10 TO 0 STEP -1
20 PRINT Z
30 NEXT Z
40 PRINT "WE HAVE LIFT OFF"
50 END
RUN
```

Type:

```
NEW
10 FOR Z=10 TO 0 STEP -1
20 FOR N=1 TO 500
30 NEXT N
40 PRINT Z
50 NEXT Z
60 PRINT "LIFT OFF"
70 END
RUN
```


WRITING A CLEAR SCREEN INTO A PROGRAM

Type:

```
NEW
10 ? "[Press SHIFT and CLEAR HOME]"
20 FOR X=1 TO 500:NEXT X
30 ? "PRESTO!"
40 FOR X=1 TO 500:NEXT X
50 ? " ♥ "
60 FOR X=1 TO 500:NEXT X
70 ? "CHANGO!"
80 FOR X=1 TO 500:NEXT X
90 GO TO 10
RUN
```

(A reverse heart will appear on the screen.)

READ DATA

```
NEW
10 READ X                    [Computer searches for data]
20 ? X                       [Computer prints data]
30 GO TO 10
40 DATA 6,2,78,3
RUN
```

If you use a READ statement, you must have a DATA statement.

OUT OF DATA error means there is no more data.

STRING DATA

Type:

```
NEW
10 READ N$
20 PRINT N$
30 GO TO 10
40 DATA STEVE, GAYL, DAVID, TINA
RUN
```

Add lines:

```
50 DATA MIKE, SCOTT, END
15 IF N$="END" THEN 60
60 END
RUN
```

Type:

```
NEW
10 A=12
20 B=14
30 READ C
40 ? A+C
50 D=B+C/6
60 ? D
70 GO TO 30
80 DATA 16, 13, 14
90 END
RUN
```

Type:

```
NEW
2000 DATA 17, 45, 61, 85, 92
2010 READ F
2020 ? 2*F, F
2030 GO TO 2010
2040 END
RUN
```

The "READ" statement tells the computer to read the data given in the "DATA" statement. Notice the computer reads data wherever it is.

TAB FUNCTIONS

Type:

```
NEW
10 PRINT TAB (10);"I"
20 PRINT TAB (15);"AM"
30 PRINT TAB (20);"GOING"
40 PRINT TAB (25);"RIGHT"
RUN
```

Type:

```
NEW
10 FOR X=1 TO 20
20 ? TAB (X);"*":NEXT
```

The TAB function on a computer is similar to the TAB function on a typewriter.

Use your imagination. Write a program using the TAB function. Try some graphics.

WRITE SOME PROGRAMS

1. Use a FOR...NEXT loop to print numbers from 1 to 10.

2. Use a FOR...NEXT loop to print the first 20 multiples of 7.

3. Write a program to print your name, address, and phone number as it would appear on an address label.

4. Write a program to ask a simple yes/no question and have the computer respond to both answers. (HINT: Use IF...THEN statements.)

5. Write a program to list the names of 5 students and their test grades.

TO LOAD A TAPED PROGRAM OR GAME

(Commodore)

1. Plug in computer.
2. Turn on switch at back of set. (On the left as you face it.)
3. Choose game or program tape.
4. Press stop/eject button on tape recorder to open.
5. Insert tape--label up and toward you.
6. Press rewind lever and wait for tape to rewind. (Check to see if reel is moving.)
7. Press STOP level (not "stop/eject")
8. Type the letters L O A D on the keyboard and press RETURN button. Computer will state that you should press the PLAY lever on the recorder. "PRESS PLAY ON TAPE #1"
9. Press the play lever. (Check to see that tape reel is moving.) Computer will state that it is searching for the program.
10. WAIT.

(Continue on next card 74)

TO LOAD A TAPED PROGRAM OR GAME

(continued)

10. (Continued) Computer will state that it has found the program and is LOADING it into the computer memory. The computer will then say that it is READY and will flash a white square.
11. Press the stop lever on the recorder (at this time you may remove the tape unless it is necessary to program more). Replace tape in storage case.
12. Type RUN on the keyboard and press the return key. Computer will give instructions.
13. If there is more than one program on the tape, type LOAD "name of program", and press RETURN.

    Press RETURN after each answer or command.
14. If you wish to see the program, type LIST and press RETURN key.
15. To slow the machine press OFF / RVS.
16. To stop the machine press RUN / STOP.

TO SAVE OR COPY A PROGRAM

1. To save all or part of a program that you have in your computer, insert new tape into cassette.
2. Type SAVE "name of program".
3. Press RETURN. Computer will say, "PRESS PLAY AND RECORD."
4. Computer will say, "WRITING "name of program" ".
5. When computer says READY, rewind tape.
6. Type VERIFY "name of program".
7. Computer will find program and verify.
8. When not using the cassette recorder, make sure none of the levers are depressed.

GLOSSARY

ASCII:	American Standard Code for Information Interchange.
ALPHANUMERIC:	Information that is made up of letters and digits.
BASIC:	Beginners All-Purpose Symbolic Instruction Code.
BIT:	The smallest unit of measure in a computer word; several bits make up a byte, or a computer word.
BYTE:	The space which a letter or digit takes up in a computer. A MEGABYTE is a million bytes. Eight bits = 1 BYTE.
CLEAR THE SCREEN:	Hold the shift key down and press the clear bar.
COMMANDS:	Such as LIST, RUN, NEW, do not need number lines.

CRT: Cathode Ray Tube (screen).

DATA: All information you want to store and use. Holds for READ statements. Example: 30 DATA 2,3,6.

END: Last line of your program.

FLOW CHARTS: Are diagrams containing questions that can be answered with a yes or no. Some programmers use charts to aid in programming.

GO SUB: Sends the program execution to a subroutine.

GO TO: Sends the program execution to another line.

IF...THEN: Sends the program execution to a given line if the condition is true. Example: 90 IF W=8 THEN 260.

INPUT: Requests data during the run--the information that goes in your computer system.

INPUT DEVICE: Tape, disk, keyboard.

INT: Rounds the current value to the next lowest integer. Example: 3.906 would be 3.

K: Means 1000. 4K, 8K, 64K, etc., is the amount of space available for ROMS and RAMS.

LET: Assigns a value to a given location.
Example: 50 LET X=7
60 LET Y=2*B/X

LIST: Prints out the current program.
LIST 20-80 lists lines 20 through 80.

LOOP: Program repeats--used with GO TO, FOR...NEXT.

FOR (STEP) Sets up and runs the body of the loop a stated number of times.
40 FOR X=1 to 9 STEP 2.

The word NEXT closes the loop. 80 NEXT Y.

NEW: Erases the current program.

OUTPUT DEVICE: Screen (CTR), printer.

PI: = 3.14159265.

PRINT: Types out messages, values, or both.
Example: PRINT "HELLO THERE"
? X, 3*X+5, 4 6
? "ANSWERS " X

PROGRAM: A list of instructions to the computer, telling it what to do and when to do it.

RAM: Random Access Memory is what "You" put into memory. It is gone when you turn off the switch.

READ: Assigns values from DATA statement to your program variables.

REM: (REMARK) Comments you want to list in your program for information. They do not affect the program.

RND ( ): Random function allows programmer to generate random numbers.

ROM: Read Only Memory, cannot be "erased" and is permanent memory in the computer.

RUN: Executes the program.

RUN 30: Starts the program at Line 30.

SQR(36):	Means the square root of 36.
STATEMENTS:	Such as PRINT, LET, INPUT, NEXT, READ, GO TO, need number lines and will be executed in correct order by the computer.
STRING:	$ is the symbol for string. A string is any value or group of letters contained within quotes such as "BOOK" or "3+6".
? SYNTAX ERROR:	This is a message from your computer telling you that you have made an error or there has been a loading error. You will then find the error or debug the program.

1

TEACHING SUGGESTIONS

You may use cards in a scheduled computer class. If you have one or two computers, you may have students go in pairs to the computer and work independently. If you have a few sets of cards, some students can work at their desks in preparation for "hands-on" time. If you have two computers and a class of 28, each student can work one period every two weeks. You may want to restrict the use of the computer to those who have all work finished and need enrichment. Each student in your class should have a set of work sheets. Every two weeks you may want to have the entire class review the lessons they have finished.

There is a set of work sheets on which to record your answers and an answer key to accompany the set of cards.

OBJECTIVES

10 Students will learn and be able to determine what computers can and cannot do.

20 Students will be able to load a tape or disk.

30 Students will be able to use the computer as a calculator.

40 Students will learn how to correct mistakes by backspacing, deleting, and using cursors.

50 Students will learn how to use all of the keys on the keyboard.

60 Students will learn to write a simple program to solve arithmetic problems.

70 Students will learn to use number lines and BASIC language to write a simple computer program.

80 Students will learn how to record and save a program.

You may want to print some Computer User's Licenses and issue one to the students who pass with a desired percentage. You may want to use this as a prerequisite for continuing the program or after-school computer time.

Edwin Markham Intermediate School

COMPUTER USER'S LICENSE

_____

Issued by: _____

Date: _____

TEST #1

COMPUTER USER'S TEST

Answer each question with a T (True) or F (False). NAME _____

1. Computers operate because of magnetic forces. ____
2. You may eat popcorn while using the computer. ____
3. You should wash your hands before using the computer. ____
4. Only one person at a time can use the computer. ____
5. A computer is not a tool. ____
6. Computers can be used as calculators. ____
7. FORTRAN, COBOL, PASCAL, and BASIC are new types of polyester fabrics. ____
8. The computer will accept any language. ____
9. You don't have to be organized to program a computer. ____
10. You may write your own program. ____
11. The computer already has some arithmetic programs. ____

NAME _____

TEST #2

Mark T (for true) or F (for false) on the lines that follow each of the statements below:

10 The shift key moves all symbols over to the left 3 spaces. ____
20 If you are angry, you use the cursor key. ____
30 The * means to multiply. ____
40 The following equation is correct: (5+5)-(2*3)=4. ____
50 If you type ?TI$, you will find out how many minutes the computer has been running (Commodore). ____
60 26↑2 means to look twice at the screen. ____
70 SQR(49)=7. ____
80 Line numbers are usually 10, 20, 30, etc., so that you can insert other statements. ____
90 You must type NEW to erase any problems in memory. ____
100 If you type a line number and press return, you eliminate information previously assigned to that line. ____
110 You can type a ? instead of PRINT. ____

NAME _____

TEST #3

1. Write an original program using at least 3 of the following statements:

    1. Loops
    2. $ (strings)
    3. INPUT
    4. IF...THEN statements
    5. TABS
    6. RND (random)
    7. READ and DATA
    8. FOR...NEXT

2. Run the program on the computer to be sure that it works.

NAME _____

THE CHIPS ARE DOWN

Answer Sheets

1. Study each care carefully.
2. Complete each activity.
3. Record all required work on answer sheets.
4. Some cards won't need written answers, but be sure you understand each card before you go on to the next.

Cards 1 - 7	Card 8	Card 8 (continued)
Card 10	Card 11	Card 14
Card 15	Card 16	Card 20

Card 21

Card 22

Card 24

Card 25

Card 25 (continued)

Card 26

Card 27

Card 29

Card 30

Card 31

Card 33

Card 34

Card 35

Card 36

Card 37

Card 39

Card 40

Card 41

Card 44

Card 45

Card 46

Card 46 (continued)

Card 48

Card 49

Card 50

Card 54

Card 52

Card 55

Card 56

Card 57

Card 58

Card 59

Card 62

Card 63

Card 65

Card 66

Card 67

Card 68

Card 69

Card 70

Card 71

Card 72

Card 72 (continued)

Card 72 (continued)

Card 72 (continued)

Card 72 (continued)

NAME _____

T H E C H I P S A R E D O W N

Answer Sheets

1. Study each care carefully.
2. Complete each activity.
3. Record all required work on answer sheets.
4. Some cards won't need written answers, but be sure you understand each card before you go on to the next.

Cards 1 - 7

Study cards 1-7. Complete all activities on them. You will have no answer to write on the answer sheet for 1-7.

Card 8

929 The "*" means to multiply.

586 The "/" means to divide.

16 The " " means "to the power of."

64

125

9

Card 8 (continued)

(Sample Problems)

PRINT 3/3	1
PRINT 64*1.2	76.8
PRINT 9 6	531441.ØØ1
PRINT 113+112.6	225.6
PRINT 1ØØ/3	33.3333333

Card 10

THIS IS EASY

Ø

Quotation marks are necessary to make the computer display data.

Card 11

Sample time ØØ:1812
(The computer has been on 18 minutes and 12 seconds.)

Set time: 153656

Time is 3:36:56 PM

Card 14

```
    LET'S
    EAT
    POPCORN
1Ø ? "MARILYN"
2Ø ? "MARILYN"
3Ø ? "MARILYN"
4Ø ? "MARILYN"
5Ø END
```

Card 15

The cursor moves below the 1Ø, but nothing happens without typing RUN.

Syntax Error in 1Ø

The equal sign is not BASIC

Card 16

Line 45 makes a blank space between the words "What's" and "New".

Card 20

4Ø When you type "LIST" the
4Ø computer displays your
4Ø program.

NO, spaces needed
NO, spaces needed
YES, you may leave spaces.

Card 21

The semicolon tells the computer to print the word on the line and leave no spaces between the letters.

Card 22

The computer displays continuously

THIS IS A LOOP

Card 24

1. Sample Program:

```
1Ø PRINT "JACK BELLYJEANS"
2Ø GO TO 1Ø
3Ø END
```

2. Sample Program

```
1Ø ? "X//X//  X  X"
2Ø GO TO 1Ø
3Ø END
```

Card 25

```
ON VIC:   1Ø    9
           3    2
          11

ON OTHER COMPUTERS:
          1Ø    9    3    2
          11
```

Card 25 (continued)

Sample program using other variables;

```
1Ø C=15
2Ø X=49
3Ø T=1.5
4Ø ? C,X,T
5Ø ? C+X*T
RUN
```

DISPLAY:

```
 15   49   1.5
 88.5
```

Card 26

```
Ø  B is not 1Ø because the
4  last given value for B
Ø  was 8.
8  1Ø
```

Card 27

NO, you do not have to use the word LET.

Card 29

In Line 4Ø, the 6Ø means "Line number 6Ø".

In Line 5Ø, the 2Ø means Line 2Ø.

Card 30

The comma divides the screen into "1Ø spaces" wide zones.

The numbers were displayed horizontally, line by line.

Card 31

Use same program, except change Line 2Ø to:

```
2Ø IF K>25 THEN 6Ø
```


Card 33

```
NEW
1Ø FOR N=1 TO 25 STEP 2
2Ø PRINT N
3Ø NEXT N
4Ø END
```

```
NEW
1Ø FOR N=3  TO 1ØØ STEP 3
2Ø PRINT N
3Ø NEXT N
4Ø END
```

Card 34

Without Line 4Ø the program will display a continuous loop that will count infinitely.

Without Line 4Ø the program will still stop at 4ØØ because the computer only goes to 1Ø when A is less than 2Ø.

Card 35

```
      1          1Ø          .1
      2          2Ø          .2
      3          3Ø          .3
      :          :
etc.  :          :
     13          13Ø         1.3
```

Card 36

```
      HI MOM
      HI MOM
      HI MOM

NEW
    1Ø ? "HELLO DOLLY": GO TO 1Ø
```

Card 37

```
Line 2Ø leaves a line
 space
Line 2Ø now leaves 2 lines
  1Ø ? "HI"
  2Ø ?:?:?
  3Ø ? "LOW"
```

Card 39

```
      VERYVERYGOOD

   VERY     VERY     GOOD

      VERYVERYGOOD
```

Card 40

```
NEW
  1Ø A$=:BILL MATHAT"
  2Ø B$="886 BAKER RD"
  3Ø C$=PLACERVILLE CA"
  4Ø ? A$:?B$:C$
  5Ø END
```

Card 41

```
WHAT IS YOUR NAME?

      Type your name

 HI  your name
```

Card 44

```
1Ø ?"HOW MANY DOLLARS DO YOU HAVE?"
2Ø INPUT D
3Ø IF D>1Ø THEN 6Ø
4Ø ?"TOO BAD"
5Ø GO TO 7Ø
6Ø ? "WILL YOU TAKE ME TO THE SHOW?"
7Ø GO TO 1Ø
```

Card 45

```
*****
*****
*****
*****
*****
```

Card 46

```
1Ø ? "HOW MANY DIMES DO YOU HAVE?"
2Ø INPUT D
3Ø ? "YOU HAVE" 1Ø*D "CENTS"
4Ø ? GO TO 1Ø
```

Card 46 (continued)

```
1Ø ?"HOW MANY NICKELS DO YOU HAVE?"
2Ø INPUT N
3Ø ?"HOW MANY DIMES DO YOU HAVE?"
4Ø INPUT D
5Ø ? "YOU HAVE" (S*N)+(1Ø*D) "CENTS."
```


Card 48

```
            CHANGE LINES
1Ø ? "PLACERVILLE TO DAVIS"
2Ø ? "DISTANCE IS 57 MILES"
3Ø LET D = 57
```

Card 49

```
NEW
1Ø INPUT "HEIGHT OF WALL IN FEET"; H
2Ø INPUT "WIDTH OF WALL IN FEET"; W
3Ø ? "YOU NEED" ; H*W "SQ. FEET OF
   WALLPAPER"
RUN
FOR EXPERTS ADD:
4Ø ? "AT $5.99 A SQ. YD. IT WILL COST
   YOU"; 5.99*((L*W)/9); "TO CARPET
```

Card 50

```
1Ø ? "ENTER NUMBER OF HAMBURGERS"
2Ø INPUT H
3Ø ? "ENTER NUMBER OF FRENCH FRIES"
4Ø INPUT F
5Ø ? "ENTER NUMBER OF SOFT DRINKS"
6Ø INPUT S
7Ø ? "TOTAL SALES=$"(.89*H)+(.63*F)+
   (.39*S)
```

Card 54

```
 9
 4
```

You must put parenthesis to find square root

5.65685425 (Because computer uses logarithms)

6 76.ØØØØØ1

Card 52

```
 7
 4
14
 4
14
```

The computer does all computations within parenthesis first, then multiplication and division, then addition and subtraction.

Card 55

VALUE	SQUARE	SQUARE ROOT
1	1	1
2	4	1.41421356
3	9	1.732Ø5Ø81
4	16	2

etc.

ADD LINE:

```
 25 IF A=21 THEN 5Ø
```

Card 56

1	1	1	2	
2	4	8	4	512
3	9	27	8	1Ø24
4	16	64	16	2Ø48
5	25	125	32	4Ø96
			64	8192
			128	16384
			256	

Card 57

```
AREA OF A CIRCLE
ENTER RADIUS
? 6
113.Ø97336
```

Actually area of second program is 113.Ø4 because P=3.14 not 3.14159265.

Card 58

35+5=4Ø

A*B	A-B	A+B
27	6	12

```
1Ø J=1Ø+45
2Ø ? "1Ø+45="J
RUN
```

Card 59

4	8
5	9
6	7
7	8
5	9
6	1Ø
7	
8	
6	
7	

The program will not run if if you do not use FOR.

Value of X changes from 3 to 4 to 5 to 6.

Value of Y changes from 1 to 2 to 3 to 4.

X+Y gives all the possible combinations.

Card 62

```
1Ø ? INT(12*RND(1)+6)
2Ø GO TO 1Ø
```

Random numbers from 6 to 17.

Card 63

To change program to multiplication, change + to * in lines 2Ø and 3Ø.

To make numbers two digit, change 1Ø to 1ØØ in line 1Ø.

Card 65

Change the value in lines 2Ø, 5Ø, and 8Ø.

Card 66

We have lift off.

Lines 2Ø and 3Ø create time delay or slow down. Some computers "sleep."

1Ø
9
8
7
6
5
4
3
2
1

Card 67

```
PRESTO!    disappears

CHANGO!    appears
```

Card 68

```
 6
 2
78
 3
? OUT OF DATA ERROR IN 1Ø
READY
```

Card 69

```
STEVE              STEVE
GAYL               GAYL
DAVID              DAVID
TINA               TINA
                   MIKE
                   SCOTT
? OUT OF DATA ERROR IN 1Ø
```

Card 70

```
          28
          16.6666667
          25
          16.1666667
          26
          16.3333333
? OUT OF DATA ERROR IN 3Ø
```

Card 71

NOTE: DO NOT LEAVE SPACE BETWEEN TAB AND (1Ø)

```
I
  AM
     GOING
           RIGHT
```

Card 72

```
1Ø FOR X=1 TO 1Ø
2Ø ? X
3Ø NEXT X
4Ø END
RUN
```

Card 72 (continued)

```
1Ø FOR X=1 TO 2Ø
2Ø ? X*7
3Ø NEXT X
4Ø END
RUN
```

Card 72 (continued)

```
1Ø ? "MR COMPUTER IZE"
2Ø ? "128 DISK DRIVE"
3Ø ? "BYTE CA Ø1Ø1Ø"
4Ø END
RUN
```

Card 72 (continued)

```
NEW
1Ø ? "DO YOU LIKE ICE CREAM (YES/NO)"
2Ø INPUT A$
3Ø IF A$ = "YES" THEN 6Ø
4Ø ? "YOU'LL STAY THIN"
5Ø GO TO 7Ø
6Ø ? "I DO TOO."
7Ø END
```

Card 72 (continued)

```
NEW
1Ø DATA "JOE","B","MARY","A"
2Ø DATA "PETE","C","KARIN","A"
3Ø DATA "NICOLE","A"
4Ø READ A$,B$
5Ø PRINT A$,B$
6Ø GO TO 1Ø
```

(see next card)

Change program to eliminate out of data.

```
 5 DIM X(5) [Saves space for DATA]
35 FOR X=1 TO 5  [Count number of
                  DATA]
6Ø NEXT X   [Reads one piece of DATA
             Goes to next piece of
             DATA]
```